710.17 Effect of FIR athletic apparel on oxygen consumption during exercise

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Athletic apparel are commercially available that are constructed with fabrics that have far-infrared radiation (FIR) properties. If such apparel are capable of inducing positive physiological effects, then there may be important implications when worn by an athlete during exercise. The purpose of this study was to examine whether FIR apparel had an effect on oxygen consumption during cycling at submaximal intensities. Twelve male cyclists completed a submaximal incremental cycling test. Each subject was tested on 4 separate days, twice while wearing a full body Control garment, and twice while wearing a similar garment made out of FIR fabric. Throughout each cycling test, the volume of oxygen uptake was calculated using data obtained from a breathing mask connected to a metabolic analysis cart. At lower cycling intensities, the subjects consumed statistically significantly ($p<0.05$) less oxygen when wearing the FIR apparel compared to the Control garment, despite performing the same amount of mechanical work. Additional research is required to determine the implication of this effect for a training or competing athlete, however the results show that this apparel technology does elicit a physiological effect. Support for this study was provided by Hologenix LLC in collaboration with adidas International. Neither source had a role in study design, testing, or interpretation.

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INTRODUCTION

Far infrared (FIR) radiation (λ=3-100 μm) is considered a promising treatment modality for certain medical conditions. [1-4]

FIR emitting ceramic nanoparticles can be impregnated into fibers, then woven into fabrics and made into apparel.

If such apparel are capable of inducing positive physiological effects, then there may be important implications when worn by athletes during exercise and/or competition.

The purpose of this study was to examine whether FIR radiating athletic apparel had an effect on oxygen consumption during cycling at submaximal intensities.

METHODS

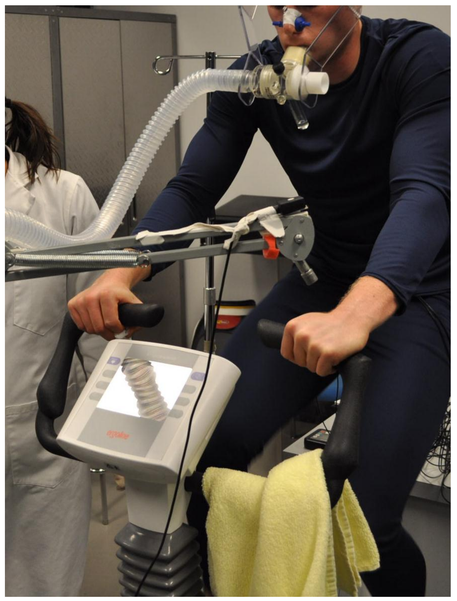
Twelve aerobically fit male recreational cyclists participated in the study.

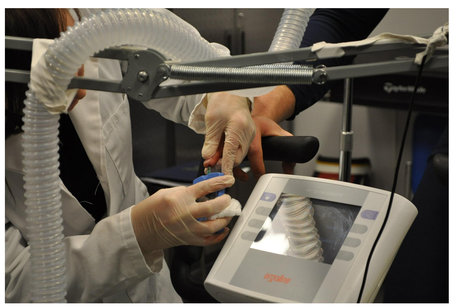
Each subject completed four submaximal incremental cycling tests; twice while wearing a full body Control garment, twice while wearing a similar garment made out of FIR radiating fabric. Tests were done at least 48 hours apart, apparel condition test order was randomized for each subject.

The test began with cycling at a relatively low intensity (< 150 W). Cycling workload was then increased by 25 W every two minutes, while cadence remained constant (digital feedback was provided). The test ended when the subject's blood lactate concentration exceeded 6 mmol/L.

Oxygen uptake was recorded throughout the entire test. Blood samples were taken 10 seconds prior to the end of each workload stage.

Blood lactate concentration data were used to estimate the times at which each subject exceeded 2 mmol/L, 4 mmol/L, and 6 mmol/L. The volume of oxygen consumed in each of three intervals (<2, 2-4, 4-6 mmol/L) were calculated and compared between apparel conditions.





RESULTS

Table: Mean oxygen data for both apparel conditions for all 12 subjects.

Oxygen Consumed [L] n=12		
Interval	***Control***	***FIR***
< 2 mmol/L :	15.48 L	15.31 L
	p-value:	< 0.05
	% diff:	1.1%
2 - 4 mmol/L :	11.87 L	11.76 L
	p-value:	< 0.05
	% diff:	0.9%
4 - 6 mmol/L :	8.94 L	8.90 L
	p-value:	> 0.51
	% diff:	---

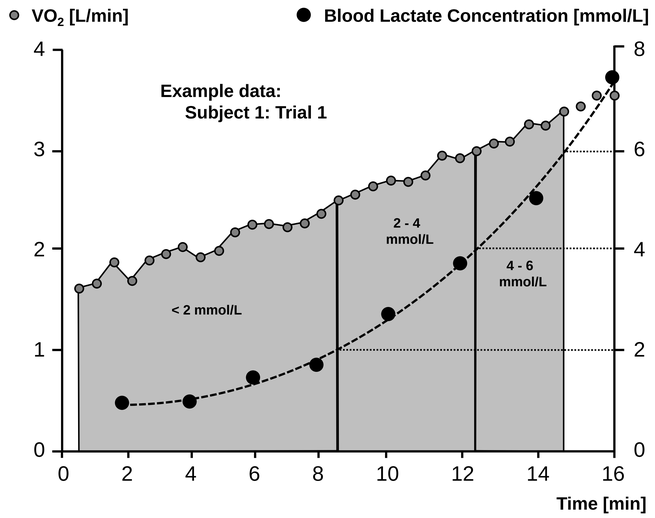


Figure: Data from Subject 1's first trial. Three relative intensity intervals were defined: < 2, 2-4, and 4-6 mmol/L. Total oxygen consumed during each of these 3 intervals was calculated and compared between conditions.

DISCUSSION & CONCLUSION

The FIR radiating apparel caused the subjects to consume less oxygen when cycling at lower intensities (blood lactate concentration < 4 mmol/L), but did not have an effect when cycling at higher intensities (> 4 mmol/L).

On average, the decrease in oxygen consumption was approximately 1.0%.

If this effect were present at an intensity corresponding to a cyclist's endurance race pace, then FIR radiating apparel may enhance performance during competition. However, further investigation is required to verify or refute this.

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ACKNOWLEDGEMENTS

Support for this study was provided by Hologenix LLC & adidas International